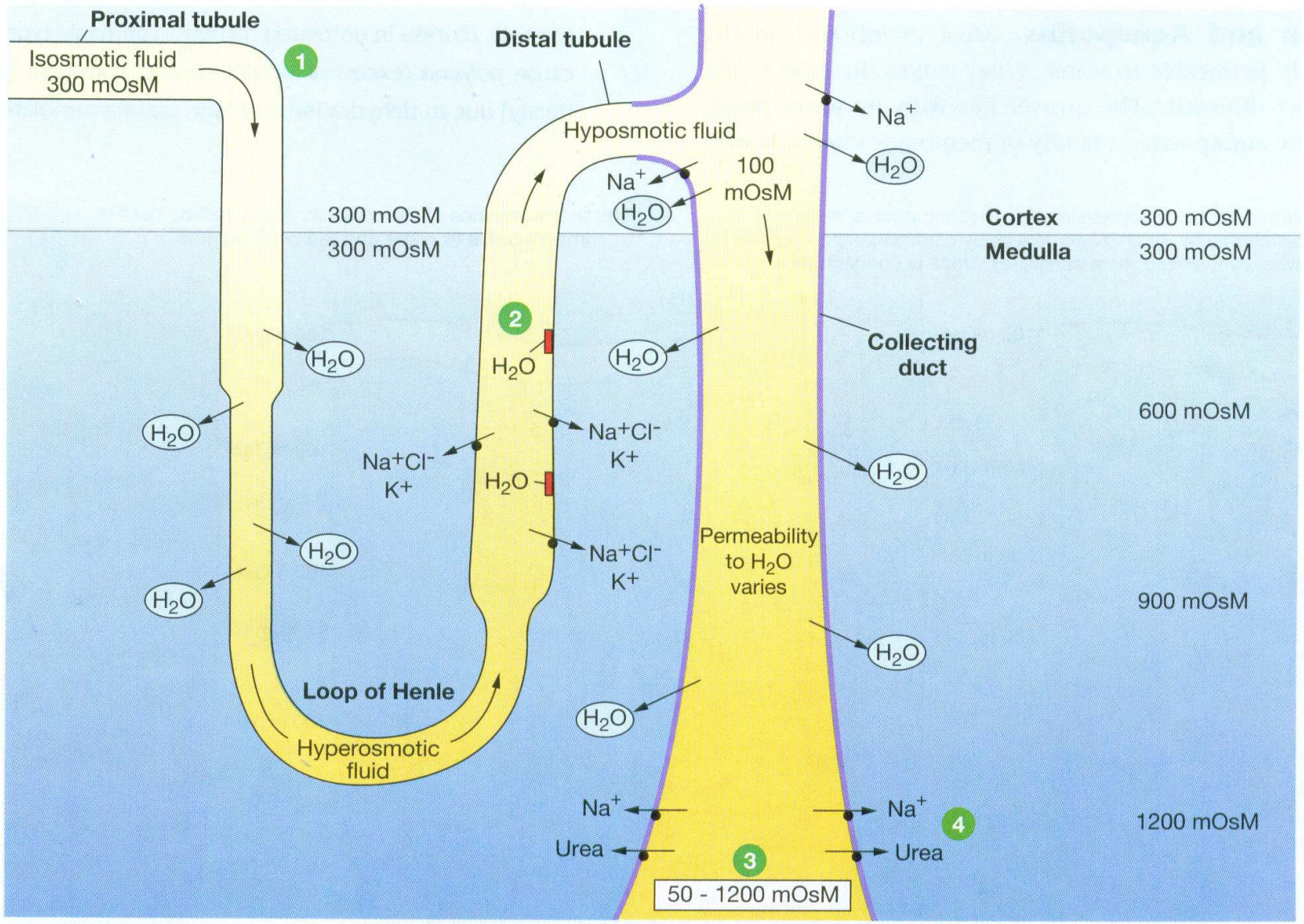


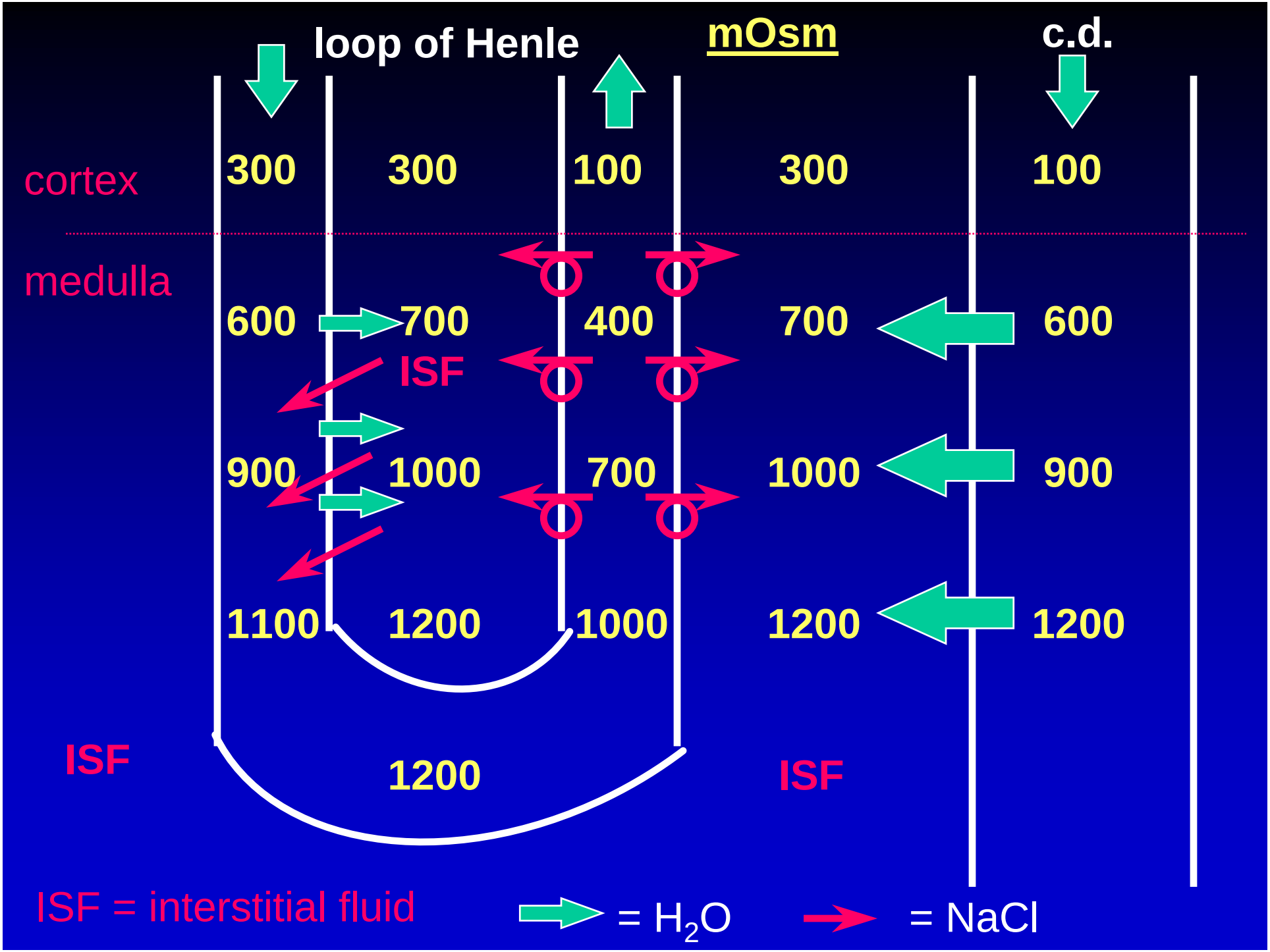
1 Fluid is isosmotic to ECF.

2 Active transport of solute creates hyposmotic fluid.

3 Urine osmolarity depends on permeability of the collecting duct.

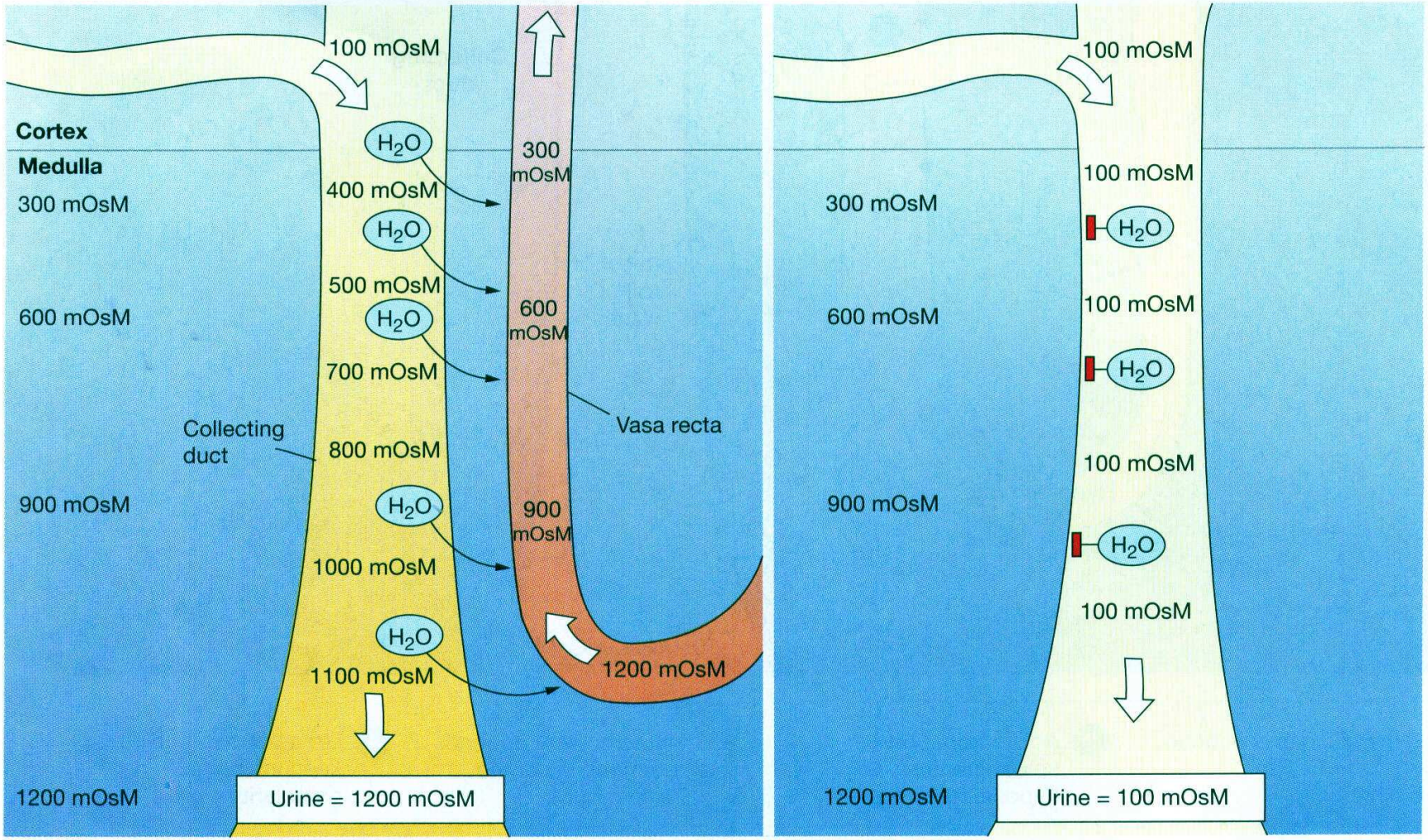
4 Urea transport helps keep interstitial osmolarity high.

Figure 20-4 *Osmolarity changes as fluid flows through the nephron*


loop of Henle
mOsm
c.d.
cortex
medulla
300
300
100
300
100
600
700
400
700
600
ISF
900
1000
700
1000
900
1100
1200
1000
1200
1200
ISF
1200
ISF
ISF = interstitial fluid
= H2O
= NaCl

(a) With maximal vasopressin, the collecting duct is freely permeable to water. Water leaves by osmosis and is carried away by the vasa recta capillaries. Urine is concentrated.

(b) In the absence of vasopressin, the collecting duct is impermeable to water and the urine is dilute.



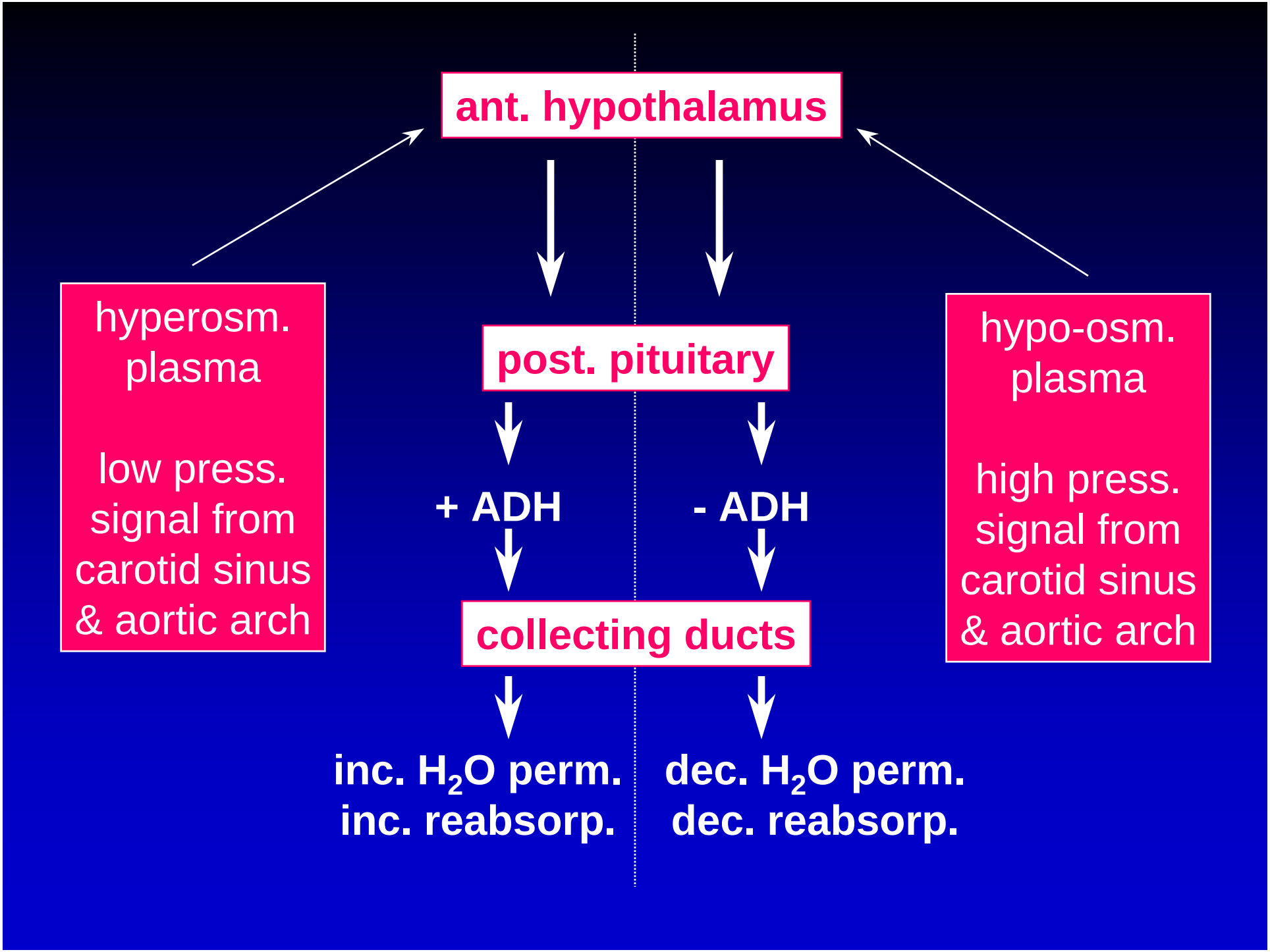
● **Figure 20-5** *Water movement in the collecting duct in the presence and absence of vasopressin*

Organism doesn’t always need to reabsorb same amount of water and/or NaCl

Although water and salt reabsorption are partially interdependent,

3 independent hormonal systems control salt and water reabsorption:

1. **anti-diuretic hormone (ADH, vasopressin) (diuresis = inc. in urinary volume)**
2. **renin-angiotensin-aldosterone**
3. **atrial natriuretic peptide (ANP) and urodilatin**


ant. hypothalamus
hyperosm. plasma
low press. signal from carotid sinus & aortic arch
post. pituitary
+ ADH
- ADH
collecting ducts
hypo-osm. plasma
high press. signal from carotid sinus & aortic arch
inc. H_2O perm.
inc. reabsorp.
dec. H_2O perm.
dec. reabsorp.

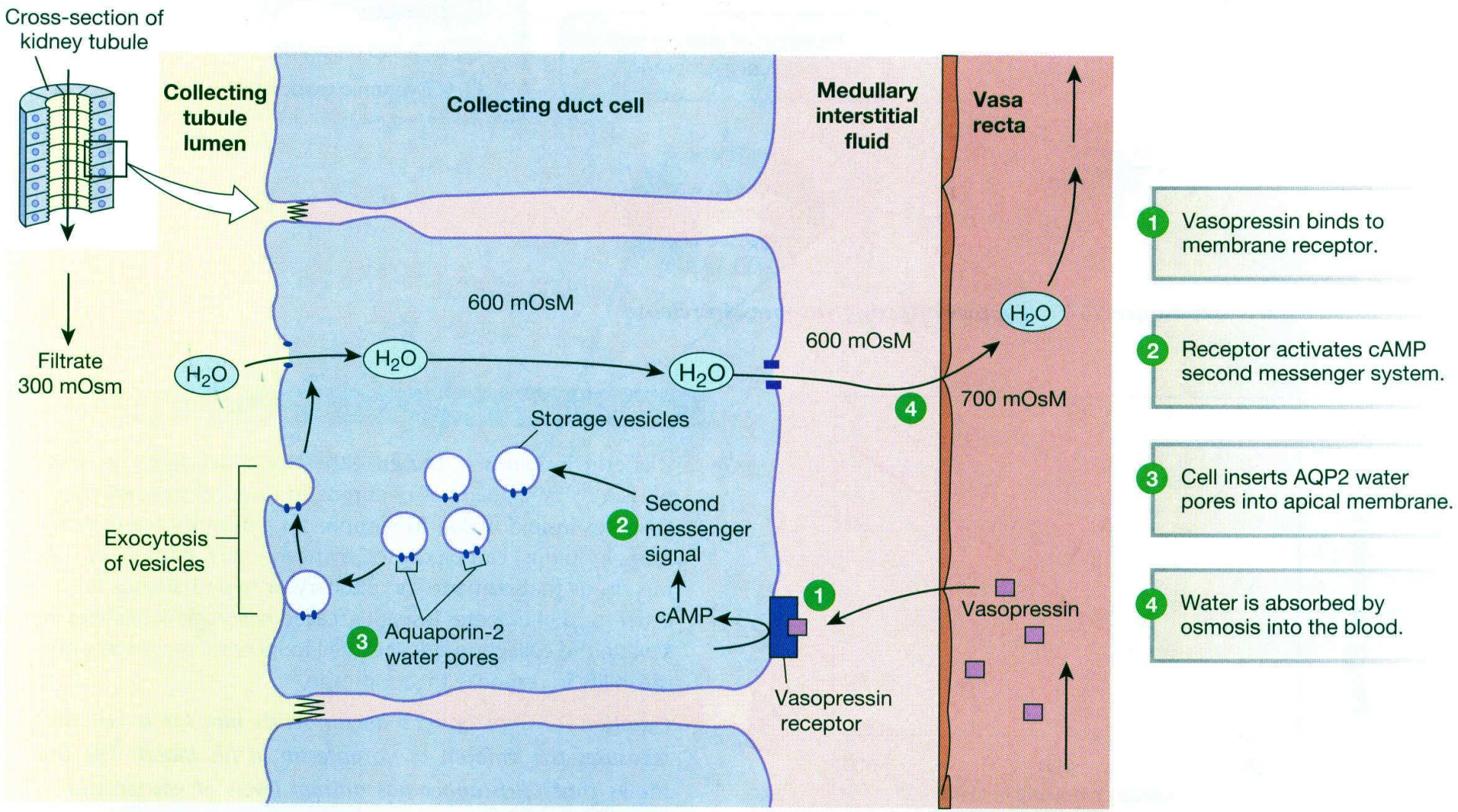
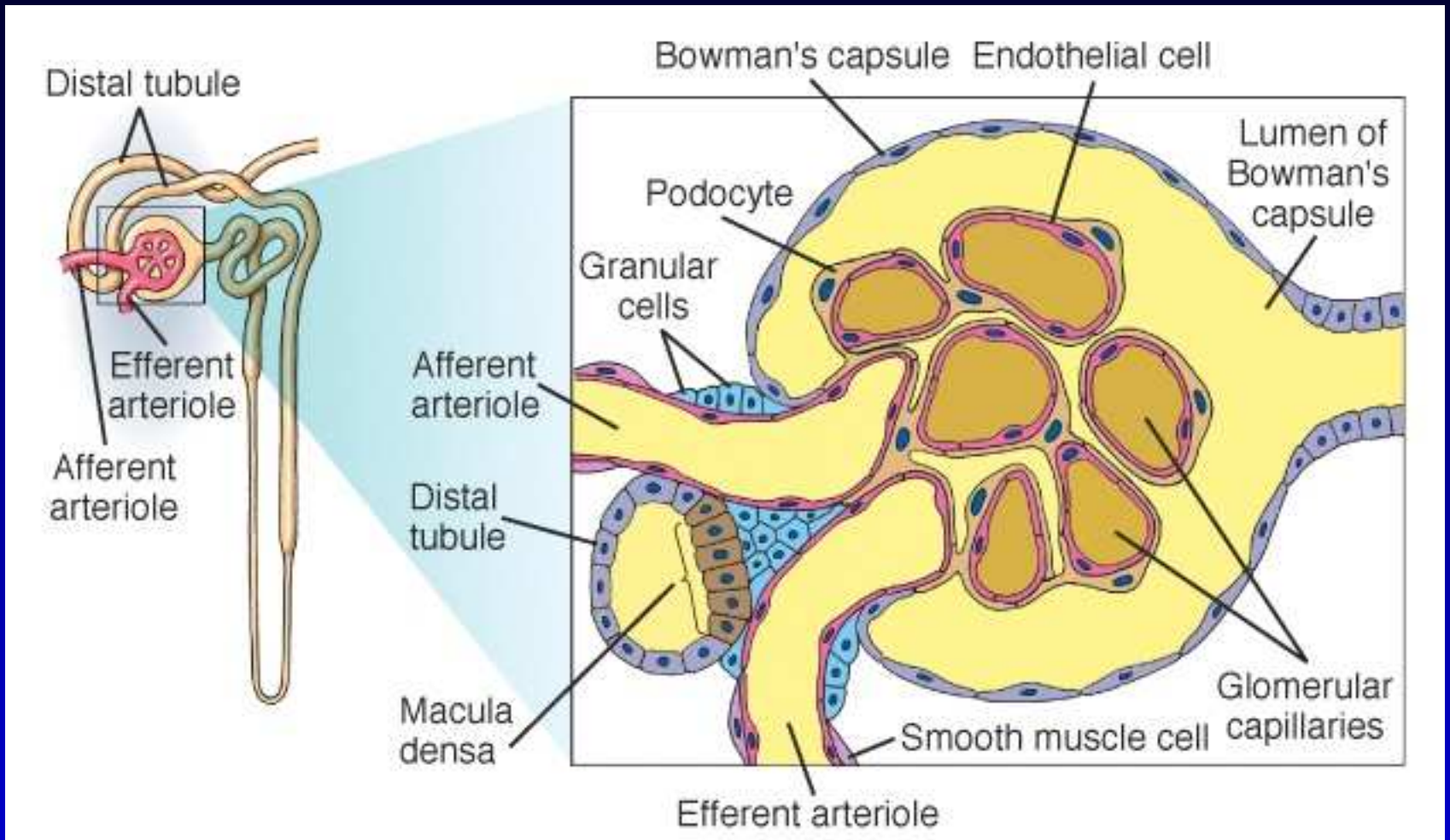
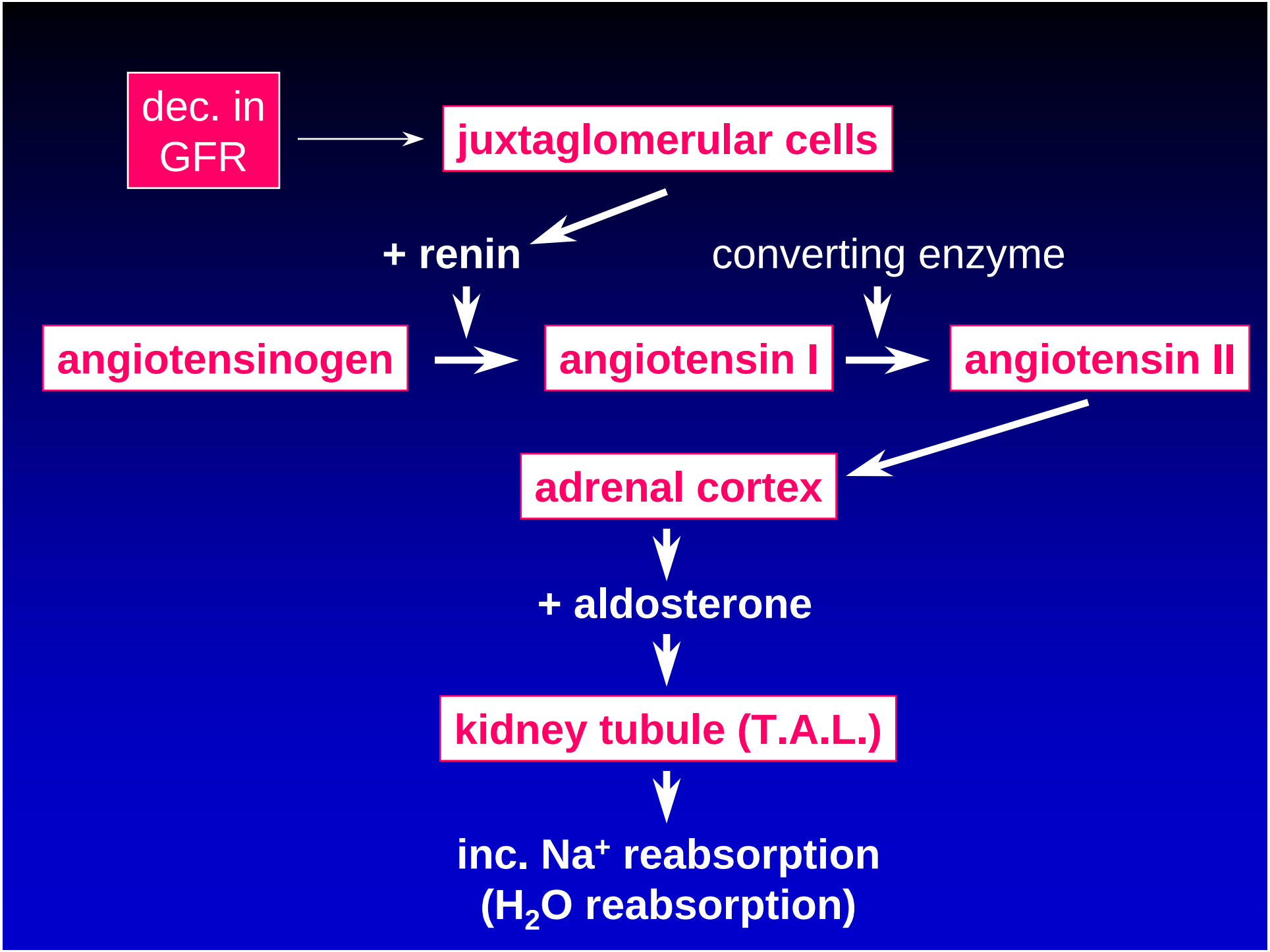


Figure 20-6 ***The mechanism of action of vasopressin*** In the absence of vasopressin, the water pores are withdrawn from the apical membrane and stored in cytoplasmlic vesicles.


Distal tubule
Efferent arteriole
Afferent arteriole
Bowman's capsule
Endothelial cell
Lumen of Bowman's capsule
Podocyte
Granular cells
Afferent arteriole
Distal tubule
Macula densa
Glomerular capillaries
Smooth muscle cell
Efferent arteriole


dec. in GFR
juxtaglomerular cells
+ renin
converting enzyme
angiotensinogen
angiotensin I
angiotensin II
adrenal cortex
+ aldosterone
kidney tubule (T.A.L.)
inc. Na+ reabsorption
(H2O reabsorption)

Atrial Natriuretic Peptide & Urodilatin

ANP - 28 amino acids - released by myocardial cells of the atria in response to distension.

Results in:

- Natriuresis
  (increased urinary excretion of sodium (Na))
- Diuresis

Urodilatin - 32 amino acids (ANP + 4) - released by kidney in response to inc. in brain [Na^+].

Results in:

- Natriuresis